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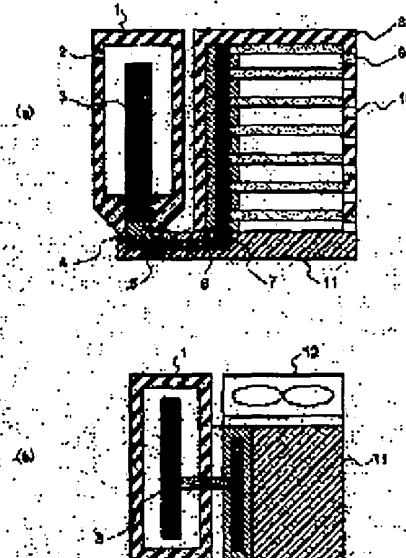
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## (54) FUEL CELL

(57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a small size fuel cell useful for a power supply of a small size apparatus which can reduce starting time, supplies liquid fuel without being bias to an mounted direction when mounting it and have a structure without leaking out the liquid fuel as well as promote simplification of a feeding system.

**SOLUTION:** In a methanol fuel cell using methanol as fuel constituted by stacking a penetrating plate, a fuel electrode, an electrolyte, an oxide agent electrode and a spreading plate, at least two of consecutive penetrating plates are bonded with absorber consisting of water and methanol.



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## CLAIMS

[Claim(s)]

[Claim 1] the electromotive member formed on both sides of an electrolyte film on a fuel electrode and the oxidizer pole, and the aforementioned electromotive one -- the fuel cell to which the unit cell which has the fuel osmosis board which adjoins the aforementioned fuel electrode of a member through a direct or fuel evaporation layer is characterized by the aforementioned fuel osmosis board adjoining a common absorber by the end side of each unit cell in the fuel cell by which two or more laminatings are carried out

[Claim 2] The aforementioned fuel osmosis board is a fuel cell according to claim 1 characterized by being formed in parallel with the aforementioned fuel electrode, and forming the aforementioned absorber in the aforementioned fuel osmosis board and a perpendicular direction.

[Claim 3] The fuel cell according to claim 2 characterized by providing the permselective membrane which adjoins the aforementioned fuel evaporation layer by the other end side of each aforementioned unit cell.

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## **DETAILED DESCRIPTION**

**[Detailed Description of the Invention]**

**[0001]**

**[The technical field to which invention belongs]** this invention relates to the fuel cell which used liquid fuel.

**[0002]**

**[Description of the Prior Art]** Conventionally, the liquid fuel cell which used the capillary force for supply of liquid fuel is indicated by JP,59-66066,A, JP,6-188008,A, etc. as a fuel cell which cut down the accessory vessel and aimed at correspondence to a miniaturization. These liquid fuel cells do not need the pump for feeding the liquid fuel which was required of the aforementioned liquid supply type fuel cell in order to supply liquid fuel to a fuel electrode by the capillary force from a fuel tank.

**[0003]** However, there is a problem as shown below also by the fuel cell of such composition.

**[0004]** Although it is suitable for a miniaturization constitutionally, since fuel was supplied to a fuel electrode in the state of a direct liquid, the conventional liquid fuel cell using the capillary force had become the cause which checks that the foam generated by working generation of heat of the foam in the tank generated in the intact prolonged period or a fuel cell makes regularity the amount of fuel supply to a fuel electrode. In such a case, there was a problem that will take a long time to start, or will originate in the prolonged thing for which adequate supply of the fuel to a fuel electrode cannot be aimed at working, and output change will arise.

**[0005]**

**[Problem(s) to be Solved by the Invention]** Since the conventional fuel cell supplied direct liquid fuel to the fuel electrode, it had the problem that required for a long time or the output change with working starting time arose.

**[0006]** this invention was made in order to solve the above-mentioned problem in the above-mentioned conventional fuel cell, since it supplied direct liquid fuel to the fuel electrode, it improves the starting characteristic, and let it be a technical problem to offer the fuel cell which a still more nearly working output change cannot produce easily.

**[0007]**

**[Means for Solving the Problem]** the electromotive member and the aforementioned electromotive one in which the fuel cell of a claim 1 is formed on both sides of an electrolyte film on a fuel electrode and an oxidizer pole in order to solve the above-mentioned technical problem -- the unit cell which has the fuel osmosis board which adjoins the aforementioned fuel electrode of a member through a direct or fuel evaporation layer is characterized in the fuel cell by which two or more laminatings are carried out by for the aforementioned fuel osmosis board to adjoin a common absorber by the end side of each unit cell

**[0008]** The fuel cell of a claim 2 is characterized by forming the aforementioned fuel osmosis board in parallel with the aforementioned fuel electrode, and forming the aforementioned absorber in this fuel osmosis board and perpendicular direction in a claim

1.

[0009] The fuel cell of a claim 3 is a fuel cell according to claim 2 characterized by providing the permselective membrane which adjoins the aforementioned fuel evaporation layer by the other end side of each aforementioned unit cell in a claim 2.

[0010]

[Embodiments of the Invention] The basic composition of the fuel cell of this invention is shown in drawing 1 . Drawing 1 (a) is a cross section and drawing 1 (b) is a plan. opening for [ 1 ] the pressure regulation inside a fuel tank in a fuel tank and 2, and 3 -- the osmosis material for fuel supply, and 4 -- the amount regulator valve of fuel supply, and 5 -- a fuel-supply way and 6 -- for the fuel osmosis board for unit cells, and 9, as for a carbon-dioxide permselective membrane and 11, the unit cell of a fuel cell and 10 are [ a heater and 7 / an absorber and 8 / a fuel cell main part and 12 ] air ventilation meanses, for example, a fan

[0011] In the fuel cell of this invention, in order to introduce liquid fuel in a cell by the capillary force by the filamentary article in the fuel-supply way 5, mechanical components, such as a pump for fuel supply, are not needed. Moreover, since the liquid fuel introduced in the cell is evaporated in a fuel evaporation layer using the heat of reaction of a cell reaction, it does not need accessory vessels, such as a fuel carburetor. Moreover, since the gaseous fuel in a fuel evaporation layer is mostly maintained at a saturation state, liquid fuel evaporates from a fuel osmosis board a consumed part of the gaseous fuel in the fuel evaporation layer by the cell reaction, and liquid fuel is further introduced by the capillary force in a cell an evaporated part. Thus, since the amount of fuel supply is being interlocked with fuel consumption, it is unreacted, and most fuel discharged besides a cell cannot be found and does not need the processor of a fuel outlet side like the conventional liquid fuel cell.

[0012] By these, liquid fuel can be supplied smoothly, without using especially accessory vessels, such as a pump, a blower and a fuel carburetor, and a condenser, and it becomes possible to attain a miniaturization therefore.

[0013] It is characterized by equipping the fuel cell of this invention with the transparency film of the carbon dioxide gas which was made in order to propose the fuel cell of the structure which how to place at the time of installing is not approached, but liquid fuel is supplied, and does not leak, and generates fuel in an absorber [ which branches in each cell ], and anode side. This absorber achieves the function supplied to the osmosis board of each cell in response to the liquid which is the member built in the stack main part of the fuel cell of drawing 1 , and is supplied from a fuel tank with an absorber. Fuel supply without a liquid spill becomes it is possible to make it the structure which sealed both the fuel tank and the stack main part, and possible by taking such structure. Furthermore, the structure where only the carbon dioxide gas which checks an anode reaction is discharged, and there is no fuel leakage becomes possible by preparing methanol the permselective membrane which is not penetrated [ which penetrates the carbon dioxide gas generated in an anode side on a stack main part ]. The above-mentioned absorber is effective by choosing the quality of the material with a high absorption property also as solution of performance dispersion resulting from shortening of warm-up time, and the dismutation of the fuel supply between cells.

[0014] In order to make connection good, you may insert in the connection of a receiver, an osmosis board, and others the porous body represented by the filter with flexibility. By the capillarity and others, a receiver may change the water absorption of a polymer, and the

pore distribution of a porous body so that a methanol and water may be uniformly supplied to a receiver. Moreover, when the pressure more than fixed was applied, destruction of the pore section and a polymer organization may take place and a certain pressure more than fixed is added in this case in the path from a junction to a receiver, you may use the leak bulb which can ease a pressure.

[0015] Although it is common that a fuel introduction mouth is in an exhaust port and opposite direction in the fuel cell of this invention, when the discharge to opposite direction is difficult, depending on the circumference environment of the equipment with which it equips, you may discharge in addition to opposite direction. Although it is common that an air introduction mouth is in an exhaust port and opposite direction in the fuel cell of this invention similarly, when the discharge to opposite direction is difficult, depending on the circumference environment of the equipment with which it equips, you may discharge in addition to opposite direction.

[0016] As a material of such an absorber, an absorptivity polymer, for example, polyvinyl alcohol which constructed the bridge, Ceramic porous-body fluororesins, such as the poly pyrrolidone film, a silica porous body, and an alumina porous body, Polyethylene, polypropylene, a polycarbonate, a polyimide, a polysulfone, Porosity films, such as a polysulfide and a polybenzimidazole, As CO<sub>2</sub> permselective membrane, a carbon molecular sieve, a polyimide asymmetric-membrane polyimide, an asymmetric-membrane biscuit-bake carbon film, a polycarbonate, polyethylene, a polysulfone, polyvinyl alcohol, a silica porous body, etc. can be raised.

[0017] The detail drawing of the stack section was shown in drawing 1 at the general drawing of composition, and drawing 2 .

[0018]

[Example] Hereafter, although it is instantiation-like, he can understand this invention more deeply by explaining the example which is not limitation-like.

[0019] (Example 1) The block diagram of the whole fuel cell was shown in drawing 1 , and the laminating cell of a stack structure was shown in drawing 2 . The manufacture method is shown below and \*\*\*\* structure is explained.

[0020] First, the electrolyte film 21 with which it consists of a perfluoro sulfonic-acid film on the 32mmx32mm fuel electrode 22 which applied the Pt-Ru system catalyst bed on the carbon cross, and the 32mmx32mm oxidizer pole 23 which applied Pt black catalyst bed on the carbon cross as a catalyst bed touches an electrolyte film was pinched. The hotpress of these was carried out by the pressure of for 5 minutes and 100 kg/cm<sup>2</sup> by 120 degrees C, and it joined. This electromotive section, 100 micrometers of average apertures as a fuel evaporation layer 24 and the carbon porosity board of 70% of porosity, and 5 micrometers of average apertures as a fuel osmosis board 26 and the carbon porosity board of 40% of porosity were built into the interior of a depth of 2mm, the diffusion board 25 with an oxidizer gas supply slot with a width of face of 1mm and the fuel-electrode side electrode holder 27, and the electromotive section electrode holder 29. It has arranged in the position of 20 by having made into the carbon-dioxide permselective membrane the asymmetric membrane (t:100 micrometers) of the polyimide which the absorber (t, ten mm) which carried out partial bridge formation of the polyvinyl alcohol with formalin from from outside the electromotive section electrode holder is contacted to this at a fuel osmosis board, and consists of hexafluoro pro PIRUJI (phenyl acid anhydride) and a diamino

diphenyl ether, and the cell of 2 was produced a reaction area of 10cm.

[0021] Thus, 1:1 (mole ratio) mixed liquor of a methanol and water was introduced into the obtained liquid fuel cell by the capillary force from the absorber 28 section as liquid fuel, the air of 1atm was passed to the diffusion board 25 by 100 ml/min as oxidizer gas, and it generated electricity at 80 degrees C. Output 0.5V (load 0.2 A/cm<sup>2</sup>) were able to be obtained continuously. Furthermore, the methanol was not detected out of the exhaust gas.

[0022] As explained above, while being able to carry out evaporation supply smoothly according to the fuel cell of this example, without revealing liquid fuel with simple structure, without using a pump, Blois, etc., shortening of warm-up time is made. Furthermore, it is stabilized by equal branching of fuel supply, and a high output can be obtained. Thereby, it can be compatible in the simplification of high performance and a system, and it becomes possible to offer the small fuel cell made difficult therefore conventionally.

[0023] (Example 2) It produced in the way which shows below the liquid fuel cell (cell) cell which has the composition shown in drawing 2. First, the electrolyte film 1 with which it consists of a perfluoro sulfonic-acid film on the 32mmx32mm fuel electrode 22 which applied the Pt-Ru system catalyst bed on the carbon cross, and the 32mmx32mm oxidizer pole 23 which applied Pt black catalyst bed on the carbon cross as a catalyst bed touches an electrolyte film was pinched. The hotpress of these was carried out by the pressure of for 5 minutes and 100 kg/cm<sup>2</sup> by 120 degrees C, and it joined. This electromotive section, 100 micrometers of average apertures as a fuel evaporation layer 24 and the carbon porosity board of 70% of porosity, and 5 micrometers of average apertures as a fuel osmosis board 26 and the carbon porosity board of 40% of porosity were built into the interior of a depth of 2mm, the diffusion board 25 with an oxidizer gas supply slot with a width of face of 1mm and the fuel-electrode side electrode holder 27, and the electromotive section electrode holder 29. It has arranged in the position of 20 by having made into the carbon-dioxide permselective membrane the asymmetric membrane (t:100 micrometers) of the polyimide which the absorber (t, ten mm) which carried out partial bridge formation of the polyvinyl alcohol with formalin from from outside the electromotive section electrode holder is contacted to this at a fuel osmosis board, and consists of hexafluoro pro PIRUJI (phenyl acid anhydride) and a diamino diphenyl ether, and the cell of 2 was produced a reaction area of 10cm. Although illustration is not carried out, you may arrange an air exhaust port so that air may be discharged in the same direction as a carbon-dioxide-gas exhaust port.

[0024] Thus, 1:1 (mole ratio) mixed liquor of a methanol and water was introduced into the obtained liquid fuel cell by the capillary force from the absorber 28 lower part as liquid fuel, the air of 1atm was passed to the diffusion board 25 by 100 ml/min as oxidizer gas, and it generated electricity at 80 degrees C. Output 0.5V (load 0.2 A/cm<sup>2</sup>) were able to be obtained continuously. This value is equivalent to the value acquired in the example 1, and the loss of power by having changed the eccrisis sense was not accepted.

[0025]

[Effect of the Invention] According to the above-mentioned composition, according to the above-mentioned composition, direct liquid fuel can be stabilized and supplied to a fuel electrode, the starting characteristic is improved, and the fuel cell which a still more nearly working output change cannot produce easily can be offered.